

lation to snowy days, and their number and distribution throughout the year are illustrated, as usual, with compact tables of mean values for a large number of stations. Mean first and last snowfalls, here effectively tabulated, are important factors in the estimation of the climate of any place.

To this point the work deals with general conditions and mean values drawn from the long and trustworthy records discussed. In the sequel, that most obvious fact about rainfall, its variability, receives attention. The outstanding and apparently abnormal features are discussed, and a very complete list of dry and wet seasons from 1851-1900 is here available for critical investigation. The attempt to correlate these changes with larger variables, cyclic or otherwise, is a most important work. The rainfall, considered in relation to the well-known sun-spot period, seems to indicate that periods of maximum precipitation are bound up with maxima of sun's spotted area. The author, however, is not able to consider these directly related as cause and effect, while he suggests that Sir Norman Lockyer's views as to the importance of prominences and allied phenomena may be nearer the true relation. The reader is specially referred to Sir Norman Lockyer's "Report on Simultaneous Solar and Terrestrial Changes" as best setting forth the general relationship between these two classes of phenomena.

The second and third volumes contain tables of data arranged under observing stations in the river basins.

The work is a monument to the value of scientific organisation and industry, and illustrates the high worth of collecting long, trustworthy, and continuous meteorological records.

#### OUR BOOK SHELF.

*The Zoological Record.* Vol. xlii. Being Records of Zoological Literature relating chiefly to the Year 1905. Edited by D. Sharp. (London: Zoological Society, 1906.)

WITH this volume ends, at any rate for the present, the series of this invaluable work with which we have been so long familiar, for next year the amalgamation with the zoological section of the International Catalogue of Scientific Literature is to commence. One effect of this change will be to make a radical alteration in the abbreviations employed for the titles of zoological serials, a change which, from the point of view of the working naturalist, is distinctly to be deplored. Whether the new arrangement will give that relief to the recorders to which the editor alludes so confidently in the preface remains to be seen.

In the main, the present volume follows the same lines as its predecessors, and displays the usual high level of excellence. By a rigorous system of cutting down, it has, however, been found practicable to make a considerable reduction in the number of papers in the general section.

Owing to the retirement of one old and experienced member of the staff, it has been necessary that a new recorder should undertake the sections dealing with reptiles (inclusive of amphibians) and fishes, and it

is unfortunate that the editor has not apparently realised that this new member of his team required more attention than the old stagers. To allude to a tithe of the serious and misleading errors in these two sections would be impossible, and we can only indicate a few of the most glaring. Geography seems a very weak point with this recorder. In the fish section, for instance, the Rio Negro is placed in Africa, while the eastern seas of the Russian Empire are included in Europe. Arabia in the reptile section comes under the heading of Africa, while in the fish section Muscat and Oman are placed in Asia. "Ophidia," too, is so placed and printed on p. 27 of the reptile record as to convey the idea that it stands for a country. It should also have been explained that "Riu-kiu" is the Chinese equivalent of "Liu-kiu" or "Loo-choo."

As to misprints, it might almost be said that their name is legion; but, as examples, it must suffice to notice *Eporates* for *Epicrates*, *gandryi* for *gaudryi*, *Hoodwell* for *Hordwell*, *Malaclemmys* for *Malacoclemmys*, and *Tyrannosaurus* (repeated in the list of new genera) for *Tyrannosaurus*. In the case of a large number of new species of reptiles the localities are omitted, while many papers quoted in the title-list are not referred to in the subject-index. None of the genera included in the Percidæ really belongs to that group.

The other recorders seem, for the most part, to have done their work well, although it would have looked better if the somewhat long list of corrigenda to the mammal record had not been required.

R. L.

*The Principles of Horticulture. A Series of Practical Scientific Lessons.* By Wilfred Mark Webb. Pp. 136. (London: Blackie and Son, Ltd., 1907.) Price 2s.

THE experience of the author as a former teacher and demonstrator in the Essex County Council School of Horticulture has served him in good stead. He puts a plant into the hands of the pupil, shows him how to study it, indicates to him what there is to be learnt from it, both as to external form and internal function, and having thus rendered help in the preliminary stages leaves the pupil to make himself master of further details by his own exertions.

We rather doubt the advantage of beginning microscopical work at so early a stage, and should prefer to defer the investigation of the minute anatomy of a plant until the pupil has become familiarised with the facts of morphology. The search for sieve-plates and companion cells might well be left until the pupil has familiarised himself with morphology and classification. Stress is very properly laid on the importance of drawing, as every student soon finds the great help of sketches of even the roughest kind, provided that they show what the draughtsman saw or intended to see. Accuracy of detail rather than artistic effect is what should be aimed at, and it is a matter of surprise to see the excellent representations which pupils make after very little practice. The illustrations in the present book afford a good example of our meaning; they show what they are intended to show, though they are not pictures. A list of the natural families, arranged according to the system of Engler, is given. For the purposes of the beginner it would, we think, have been better to have picked out some dozen or score of the most important orders, and to have omitted a mass of detail not required by the average student and not full enough for those who desire more complete information.

A section is devoted to the insects which prey upon plants, and to the measures to be taken for the destruction of these pests, as well as of fungi. That the book is up to date may be gathered by the references to Mendelism and De Vries.

A copious index is given, as well as hints as to the way in which examination questions should be answered.

A little more information as to the "reason why" of digging, watering, striking cuttings, and other garden operations would have increased the value of the book, which nevertheless is one which can confidently be recommended to the attention of all those interested in gardening.

*Dr. Schlich's Manual of Forestry.* Vol. iv. Forest Production. By W. R. Fisher. Being an English adaptation of "Der Forstschutz," by Dr. Richard Hess. Second edition. Pp. xxiii+712. (London: Bradbury, Agnew and Co., Ltd.)

This volume is the second edition of Prof. Fisher's "Forest Protection," and is uniform with the third edition of vols. i., ii., and iii. of Dr. Schlich's "Manual of Forestry." The book is an English adaptation of Dr. Hess's "Forstschutz," that is, it is not a mere translation, as the author has exercised discretion in his selection of material in order to make the book more adapted to the use of British and Indian foresters. New illustrations have also been added which are not in the German edition. The subject of forest protection is of immense importance, and covers a wide field of knowledge, practically including every branch of scientific silviculture. The author has arranged and presented the various protective measures to be adopted against inimical agencies, both in the organic and inorganic worlds, in a very clear and interesting manner. The volume also contains a useful index at the end. Prof. Fisher has done valuable work by rendering available to student and forester a vast store of information which has hitherto been accessible only to a few. The book is one which we can warmly recommend to all those who have forests or trees under their charge.

*The Essentials of Histology, Descriptive and Practical.* By Prof. E. A. Schäfer, F.R.S. Seventh edition. Pp. xi+507. (London: Longmans, Green and Co., 1907.) Price 10s. 6d. net.

THE fact that this volume has reached its seventh edition shows conclusively that it supplies a want. The features of the present edition are the introduction of colouring in the illustrations and a considerable increase in the part devoted to the nervous system. In this portion practically a new set of illustrations appears, which can only be described as admirably calculated to indicate the salient points which the elementary student must be familiar with. Either for the purely scientific or for the medical student this book will continue to be of the highest value.

*Actualités scientifiques.* By Max de Nansouty. Pp. 361. (Paris: Schleicher Frères, 1906.) Price 3.50 francs.

THE general character of this annual publication was described in noticing the issue for 1905 in NATURE of November 23, 1905 (vol. lxxiii., p. 76). The short essays on scientific subjects of current interest range over most branches of science, and should be useful as reading exercises in French classes in schools where the pupils also learn something of science.

## LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

### A Hydraulic Analogy of Radiating Bodies for Illustrating the Luminosity of the Welsbach Mantle.

THE device about to be described enables us to illustrate to a class the behaviour of different types of radiating bodies when introduced into a flame, and will be found especially useful in explaining the remarkable luminosity of the incandescent mantles used in modern gas-lighting. It is, of course, not intended to explain the mechanics of radiation, but merely to enable us to describe certain phenomena in terms of easily grasped notions.

Students are told that the more powerfully a body absorbs the more powerfully will it emit when heated, this relation holding for every individual wave-length. Black bodies, then, give out the most light when heated. The fact that a white block of lime is far more luminous than a carbon rod when heated in the oxyhydrogen flame is not usually cited in support of this law, while the fact that the most luminous body of all, the Welsbach mantle, is also quite white, is equally unsatisfactory as an illustration, for white bodies are in reality transparent, that is, they are made up of masses of small transparent particles, and transparent bodies ought not to emit at all. It is, of course, necessary to define just what we mean by transparency in this case, and it may be well to consider first a somewhat analogous case. The absorption which is accompanied by high emissivity is true absorption, and not selective reflection, which is sometimes confused with absorption. A highly reflecting polished metal surface is a poor radiator, but by properly constructing its surface we may give it the power to absorb and emit. A bundle of polished steel needles with their points all turned towards the source of light reflects scarcely any light at all, the rays undergoing multiple reflections between the conical ends of the needles. Such a bundle of needles should emit much more powerfully than a polished steel surface, and it is easy to see just why it should do so. Each needle, seen end on, sends not only emitted light to the eye, but reflects rays coming from its neighbours. The surface formed by the points of the needles can be regarded as an absorbing surface, which absorbs in virtue of its structure; it is analogous to the hollow "black bodies" with which we are now familiar. The point which I wish to emphasise is that such a surface, which absorbs not at all in virtue of its molecular nature, is also a powerful radiator, the mechanism by which its radiating power has been increased being as indicated above.

Suppose, now, we take a perfectly transparent body, which, like a perfect reflector, has no emitting power. A bead of microcosmic salt (sodium pyro-phosphate) heated in a blast lamp is a good example. Though the platinum wire which supports it glows with vivid incandescence, the bead remains perfectly dark. A glass bead, however, emits a good deal of light, doubtless from the fact that its transparency is much less at high temperatures, a very common behaviour of transparent substances. The microcosmic salt on cooling becomes traversed by hundreds of cleavage planes, which give it a milky appearance. On re-heating it it emits light strongly, until it finally fuses into a transparent drop, when it instantly becomes dark again. The reason for this behaviour is not quite so apparent as in the case of the needles. In fact, I am not quite sure that I understand it at all. Quartz behaves in the same way. A drop of clear fused quartz, heated in the blast, emits little or no light, but if it contains spots made up of an emulsion of quartz and air, these spots emit strongly. In other words, an opacity resulting from a pulverisation of the transparent medium seems to be accompanied with a strong emitting power. Apparently we cannot apply the same reasoning as in the case of the needles, and it looks rather as if the radiation was largely a surface effect. If this is so, it is obvious that an